

REMARKS

The present Amendment amends claims 1, 11, 21 and 23, leaves claims 2-10, 12-20 and 22 unchanged, and adds claims 24-27. Therefore, the present application has pending claims 1-27.

Support for Amendments

The amendments to the claims find support, for example, in Figs. 1 and 6 and paragraphs [0084], [0094]-[0095], [0101]-[0102] of U.S. Patent Application Publication No. 2005/0033828 of the present application ("Publication").

35 U.S.C. §112 Rejections

Claims 1-10 stand rejected under 35 U.S.C. §112, first paragraph as allegedly failing to comply with the written description requirement. This rejection is traversed for the following reasons. Applicants submit that claims 1-10, as now more clearly recited, are in compliance with the provisions of 35 U.S.C. §112.

Claims 11-20 stand rejected under 35 U.S.C. §112, first paragraph as allegedly failing to comply with the written description requirement. This rejection is traversed for the following reasons. Applicants submit that claims 11-20, as now more clearly recited, are in compliance with the provisions of 35 U.S.C. §112.

Claims 23 and 24 stand rejected under 35 U.S.C. §112, first paragraph as allegedly failing to comply with the written description requirement. This rejection is traversed for the following reasons. Applicants submit that claims 23 and 24, as now more clearly recited, are in compliance with the provisions of 35 U.S.C. §112.

Claims 1, 11 and 23 stand rejected under 35 U.S.C. §112, second paragraph as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. This rejection is traversed for the following reasons.

Applicants submit that claims 1, 11 and 23, as now more clearly recited, are in compliance with the provisions of 35 U.S.C. §112.

35 U.S.C. §102 Rejections

Claims 1-24 stand rejected under 35 U.S.C. §102(e) as being anticipated by U. S. Patent No. 7,065,589 to Yamagami. This rejection is traversed for the following reasons. Applicants submit that the features of the present invention as now more clearly recited in claims 1-20 are not taught or suggested by Yamagami, whether taken individually or in combination any of the other references of record. Therefore, Applicants respectfully request the Examiner to reconsider and withdraw this rejection.

Amendments were made to the claims to more clearly describe features of the present invention. Specifically, amendments were made to the claims to more clearly recite that the present invention is directed to a remote copy system and method as recited, for example, in independent claims 1, 11, 21 and 23.

The present invention, as recited in claim 1, and as similarly recited in claims 11, 21 and 23, provides a system. The system includes a first storage unit system connected to a computer and having a first storage area and a first controller, where the first storage area includes a first disk device and a first control information area, and where the first control information includes first control information. The system also includes a second storage unit system having a second storage area and a second controller, where the second storage area includes a second disk device and a second control information area, and where the second control information area includes second control information. The system further includes a third storage unit system connected to the first storage unit system and the second storage unit system and having a third storage area and a third controller.

According to the present invention, the third storage area includes a queue area that stores journal information, and a third control information area. The third control information area includes a primary control information area and a secondary control information area.

Also according to the present invention, the first controller responds to a write request received from the computer to transmit to the third storage unit system a journal including write data received from the computer and address information indicative of a position in the second storage unit system at which the write data is to be written. The first controller also stores the write data in the first disk device. Further, the first controller writes the journal to the queue area of the third storage unit system. Furthermore, the first controller writes the first control information to the primary control information area, the first control information including a primary head position indicating a head position of data subjected to copying, and a primary size indicating a size of the data during copying. Even further, the first controller returns a response to the write request to the computer after transmitting the journal.

Furthermore, according to the present invention, the second controller reads the first control information from the third storage unit system at regular intervals to determine whether there is new data to be copied. The second controller also copies the first control information as second control information into the secondary control information area when the second controller determines that there is new data to be copied, and updates the second control information in the secondary control information area and the second control information area, the second control information including a secondary head position and a secondary size. The second controller further acquires the journal from the third storage unit system based on the first control information. Furthermore, the second controller stores the write data in

the second disk device based on the address information included in the journal.

Even further, according to the present invention, said first controller further reads said secondary head position and said secondary size in the secondary control information at regular intervals. The first controller also determines whether the first control information needs to be updated, and updates said first control information in said first control information area, when said first controller determines that said first control information needs to be updated. The prior art does not disclose all of the above-identified features.

The above described features of the present invention, as now more clearly recited in the claims, are not taught or suggested by any of the references of record, particularly Yamagami, whether taken individually or in combination with any of the other references of record.

Yamagami teaches a three data center remote copy system with journaling. However, there is no teaching or suggestion in Yamagami of the remote copy system and method as recited in claims 1, 11, 21 and 23 of the present invention.

Yamagami discloses a remote copy system that includes a first storage system, a second storage system and a third storage system. The first storage system includes a first storage controller and a first data volume. The first storage controller is configured to control data access requests to the first data volume. The first storage system is configured to store write data in the first data volume upon receiving a write request from a first host associated with the first storage system and generate a journal including control data and journal data. The second storage system includes a journal volume and configured to receive and store the journal generated by the first storage system in the journal volume. The third storage system includes a second data volume and configured to receive the journal from

the second storage system and store the journal data of the journal to the second storage system according to information provided in the control data.

One feature of the present invention, as recited in claim 1, and as similarly recited in claims 11, 21 and 23, includes where the third storage area includes: a queue area that stores journal information; and a third control information area, the third control information area including a primary control information area and a secondary control information area. Yamagami does not disclose this feature.

As shown in Fig. 1, the present invention provides an intermediate storage subsystem, which includes a control information area 113 and a remote copy queue (RCQ) area 114 that stores journal data. As shown in Fig. 6, the control information area 113 includes a primary control information area 631 and a secondary control information area 632. This is quite different from Yamagami, which merely includes a control data area 230 in the journal volume 112'.

Another feature of the present invention, as recited in claim 1, and as similarly recited in claims 11, 21 and 23, includes where the first controller: responds to a write request received from the computer to transmit to the third storage unit system a journal including write data received from the computer and address information indicative of a position in the second storage unit system at which the write data is to be written, stores the write data in the first disk device, writes the journal to the queue area of the third storage unit system, writes the first control information to the primary control information area, the first control information including a primary head position indicating a head position of data subjected to copying, and a primary size indicating a size of the data during copying, and returns a response to the write request to the computer after transmitting the journal. Yamagami does not disclose this feature.

For example, Yamagami does not disclose where the first controller writes the first control information to the primary control information area of the third storage system unit, where the primary control information includes a primary head position and a primary size. In the present invention, the primary storage subsystem writes the data to be copied to the secondary storage subsystem into the queue area 114 of the intermediate storage subsystem, and also writes the data range information (primary head position 619 and primary size 620) into the primary control information 631 in the control information area 113 of the intermediate storage subsystem (see, for example, paragraph [0094] of the Publication of the present application). Yamagami does not disclose this feature.

Yet another feature of the present invention, as recited in claim 1, and as similarly recited in claims 11, 21 and 23, includes where the second controller: reads the first control information from the third storage unit system at regular intervals to determine whether there is new data to be copied, copies the first control information as second control information into the secondary control information area when the second controller determines that there is new data to be copied, and updates the second control information in the secondary control information area and the second control information area, the second control information including a secondary head position and a secondary size, acquires the journal from the third storage unit system based on the first control information, and stores the write data in the second disk device based on the address information included in the journal. Yamagami does not disclose this feature.

In the present invention, the secondary storage subsystem reads the primary head position 619 and the primary size 620 in the primary control information 631 at regular intervals. If the secondary storage subsystem detects that there is new data

to be copied, the secondary storage subsystem writes the range information (secondary head position 619 and secondary size 620) of data during the copy into the secondary control information 632 in the control information area 113. When the secondary storage subsystem completes the data copy, the secondary storage subsystem updates the secondary head position 619 and the secondary size 620 (see, e.g., paragraphs [0101]-[0102] of the Publication of the present application).

Unlike the present invention, the control data (Figs. 2 and 3) of Yamagami is written by the primary system only (Fig. 8). The present invention provides where the control information is written by both the primary storage subsystem and the secondary storage subsystem.

Still yet another feature of the present invention, as recited in claim 1, and as similarly recited in claims 11, 21 and 23, includes where the first controller further: reads the secondary head position and the secondary size in the secondary control information at regular intervals, determines whether the first control information needs to be updated, and updates the first control information in the first control information area, when the first controller determines that the first control information needs to be updated. Yamagami does not disclose this feature.

In the present invention, the primary storage subsystem reads the secondary head position 619 and the secondary size 620 in the secondary control information 632 at regular intervals. The primary storage subsystem checks whether there is any copy completed data. If there is any copy completed data, the primary storage subsystem deletes the corresponding data from the queue area 114 and updates the primary head position 619 and the primary size 620 (see, for example, paragraph [0095] of the Publication of the present application).

Therefore, Yamagami fails to teach or suggest "wherein the third storage area

comprises: a queue area that stores journal information; and a third control information area, said third control information area comprising a primary control information area and a secondary control information area" as recited in claim 1, and as similarly recited in claims 11, 21 and 23.

Furthermore, Yamagami fails to teach or suggest "wherein said first controller: responds to a write request received from said computer to transmit to said third storage unit system a journal including write data received from said computer and address information indicative of a position in said second storage unit system at which said write data is to be written, stores said write data in said first disk device, writes said journal to said queue area of said third storage unit system, writes said first control information to said primary control information area, said first control information including a primary head position indicating a head position of data subjected to copying, and a primary size indicating a size of the data during copying, and returns a response to said write request to said computer after transmitting said journal" as recited in claim 1, and as similarly recited in claims 11, 21 and 23.

Further, Yamagami fails to teach or suggest "wherein said second controller: reads said first control information from said third storage unit system at regular intervals to determine whether there is new data to be copied, copies said first control information as second control information into said secondary control information area when said second controller determines that there is new data to be copied, and updates said second control information in said secondary control information area and said second control information area, said second control information including a secondary head position and a secondary size, acquires said journal from said third storage unit system based on said first control information, and stores said write data in said second disk device based on the address

information included in said journal" as recited in claim 1, and as similarly recited in claims 11, 21 and 23.

Yet even further, Yamagami fails to teach or suggest "wherein said first controller further: reads said secondary head position and said secondary size in the secondary control information at regular intervals, determines whether the first control information needs to be updated, and updates said first control information in said first control information area, when said first controller determines that said first control information needs to be updated" as recited in claim 1, and as similarly recited in claims 11, 21 and 23.

The combined features of the present invention provide where the data transfer from the primary site to the secondary site can be performed by simple read and write operations by the primary and secondary sites to and from the intermediate site. The intermediate site of the present invention does not need any special function or mechanism for the data copy. Furthermore, in the present invention, the primary knows that the data is transferred to the secondary site after the secondary site receives the data. That is, the primary site knows that the data copy is complete, with guarantee of the secondary site.

On the other hand, in Yamagami, the intermediate storage system returns acknowledgement when the intermediate storage system receives the data from the primary storage system. Next, the intermediate storage system sends the data to the secondary storage system, as shown in Figs. 8 and 9. The primary storage system receives the acknowledgement when the data reaches the intermediate storage system. However, the data is not guaranteed to be in the secondary storage system at this time of the process. Accordingly, in addition to the above-described distinctions, the present invention differs from Yamagami with respect to the timing

at which the primary storage subsystem recognizes that the data transfer is completed.

Furthermore, in Yamagami, the intermediate storage system starts to send the data to the secondary storage system, as shown in Fig. 9. In this way, the intermediate storage system in Yamagami has the function of starting the data transfer.

In the present invention, the secondary storage subsystem checks the control information in the intermediate storage subsystem and starts the data reading. The present invention further distinguishes over Yamagami in that in the present invention, the intermediate site need not have any special function for actively starting the data transfer.

Therefore, Yamagami does not teach or suggest the features of the present invention, as recited in claims 1-24. Accordingly, reconsideration and withdrawal of the 35 U.S.C. §102(e) rejection of claims 1-24 as being anticipated by Yamagami are respectfully requested.

The remaining references of record have been studied. Applicants submit that they do not supply any of the deficiencies noted above with respect to the references used in the rejection of claims 1-24.

New Claims 25-27

Claims 25-27 were added to more clearly describe features of the present invention. Claims 25-27 are dependent on claims 1, 11 and 23, respectively. Accordingly, claims 25-27 are allowable for at least the same reasons previously discussed regarding independent claims 1, 11 and 23.

Furthermore, claims 25-27 are fully supported by the disclosure. For example, the Examiner's attention is directed to page 35, line 19 to page 36, line 17

(paragraph [0105] of U.S. Patent Application Publication No. 2005/0033828 of the present application) and page 37, lines 8-11 (paragraph [0109] of U.S. Patent Application Publication No. 2005/0033828 of the present application) of the specification. As described in paragraph [0105], "The time series information includes serial number of request in the in the queue (request ID) 704 . . . and is used to . . . check a dropout of request." As further described in paragraph [0109], "each request contains both of the control information and write data received from the host 102 . . . and is *also called a journal*."

In view of the foregoing amendments and remarks, Applicants submit that claims 1-27 are in condition for allowance. Accordingly, early allowance of claims 1-27 is respectfully requested.

To the extent necessary, the applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, or credit any overpayment of fees, to the deposit account of MATTINGLY, STANGER, MALUR & BRUNDIDGE, P.C., Deposit Account No. 50-1417 (referencing Attorney Docket No. 500.43155X00).

Respectfully submitted,

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